EVALUATION OF DIFFERENT TAX REFORM PROPOSALS

Muhammad Nadeem Sarwar

(CGP #02-138)

2ND RASTA CONFERENCE

Wednesday 1st & Thursday 2nd June 2022

Marriott Hotel, Islamabad

This document is unedited author's version submitted to RASTA.

RESEARCH FOR SOCIAL TRANSFORMATION & ADVANCEMENT

Pakistan Institute of Development Economics

Islamabad

ABSTRACT

Tax is an important tool of fiscal policy which generates revenue and enable governments to finance current and development expenditures. However, taxes leave individuals and firms with less income and therefore, they have to compromise their consumption. Thus, tax system of a country affects its economic growth and welfare of the people. A good tax system should generate sufficient resources for the government without overburdening the households and firms. Since change in tax policy has long reaching impacts on various interconnected economic agents, therefore, the impact of tax reforms is analyzed using general equilibrium approach, considering the interrelationships between all the sectors of economy. This study uses computable general equilibrium model to quantify the impact of changes in direct and indirect tax rate policies on various economic indicators including economic growth, consumption, investment, exports, sectoral shifts and income. For this, we first develop social accounting matrix based on 2017 data and then run simulations. The results show that in the long run, reducing personal income tax rates will result in increasing consumption expenditures, government expenditures and income of various types of labour but decreasing economic growth and exports. However, reducing introducing flat income tax rate along with decreasing corporate tax, sales tax and custom duty will result in increasing economic growth, exports, consumption expenditures and household income. Therefore, we recommend simplifying tax regime by abolishing inefficient and distortionary taxes and reducing rates of all types of taxes as a suitable policy for economic growth and household welfare.

PREFACE

The choice of tax structure directly affects tax revenues, economic growth, and income distribution. Therefore, while developing a comprehensive taxation system, the governments must be cautious to take proper account of its macroeconomic and distributional impact. This study aims to evaluate various tax rate reform proposals with respect to their impact on key macroeconomic indicators using general equilibrium framework. Sspecifically, the study identifies and quantifies the direction and magnitude of impacts of reducing marginal income tax rate, decreasing the number of slabs, and introducing a flat income and corporate tax rate with reduction in sales tax and custom duty etc. on the economy at both macro and micro level. This includes the effect of such changes on economic growth, consumption, exports, and income etc.

The study will not only provide government and policy makers with a comprehensive comparative analysis of various tax rate proposals but also offers a platform to analyse any other such option. Given low tax to GDP ratio and economic growth in Pakistan, this study aims to help address these challenges.

The results are these studies are based on Social Accounting Matrix developed based on 2017 data and Computable General Equilibrium model. The outcomes show that lowering tax rates, simplifying tax regime by restricting to few taxes will result in economic growth, more exports and higher income to households and firms. This is important policy lesson for policy makers as in our country, economic growth is negatively affected by ineffective tax policies.

I am thankful to RASTA CGP for funding this study. Also thankful to Dr David Orden, Dr. Ahmad Jamal Pirzada, Dr. Nadeem ul Haque, Dr. Asma Hyder, Dr Nasir, Dr Amir Hidayat and Mr. Imtiaz Solangi for helping me during various stages in present study.

Table of Contents

PREFACE ii

LIST OF TABLES v

LIST OF ABBREVIATIONS vii

INTRODUCTION 1

1.1. Scope of Research 1

REVIEW LITERATURE 3

SOCIAL ACCOUNTING MATRIX 2017 6

3.1 Literature on SAM (Pakistan Specific) 6

3.2 Parts of SAM 7

Steps to Build a SAM 8

Current SAM 9

3.3 Structure of the Economy 12

Value Added Shares of Factors of Production 12

Sectoral Trade Shares 13

INTERMEDIATE AND FINAL DEMAND 14

COMPUTABLE GENERAL EQUILIBRIUM MODEL 15

4.1 Dimensions of the Model 15

4.2 Naming System 17

4.3 Production Block 18

4.4 Commodity Output Block 19

4.5 Final Demand Block 20

Export Demand 22

Other Demands 22

Price System 22

4.6 Trade Balance and Other Aggregates 23

4.7 Factor Markets 23

4.8 Institutions 23

Household 23
Government 24
Firms 24
Rest of the World 25
4.9 Model Closure 25
Policy Scenarios and Impacts 25
Simulation 1: Income Tax rate brackets 25
RESULTS AND INTERPRETATION 26
5.1 Key Macroeconomic Indicators 26
5.2 Sectoral Impacts 27
5.3 Effects on Labour Income 29
CONCLUSION AND POLICY RECOMMENDATIONS 31
REFERENCES 33

LIST OF TABLES

Table 1: A Generic Schematic SAM 11
Table 2: Value Added Shares 12
Table 3: Trade Share of Each Sector 13
Table 4: Demand Breakup (In Percentage) 14
Table 5: Details of Sets 16
Table 6: Name System 17
Table 7: Proposed Personal Income Tax Rate 25
Table 8: Key Macroeconomic Indicators 26
Table 9: Sectoral Impacts of Tax Reforms 28
Table 10: Impact on Labour Income 30

LIST OF FIGURES

Figure 1 Building SAM *9*
Figure 2: Production Structure *18*
Figure 3: Composition of Outputs, adopted from M. Horridge (2003) *20*
Figure 4: Investment Demand (Amir et al., 2013; M. Horridge, 2003) *21*
Figure 5: Household Demand for Commodities (J. Horridge, 2000) *21*

LIST OF ABBREVIATIONS

SAM	Social Accounting Matrix
CGE	Computable General Equilibrium
IO Table	Input-Output Table
ADB	Asian Development Bank
HIES	Household Integrated Economic Survey
LFS	Labour Force Survey
PBS	Pakistan Bureau of Statistics
PIT	Personal Income Tax
CIT	Corporate Income Tax
GDP	Gross Domestic Product
CPI	Consumer Price Index

INTRODUCTION

To provide people with public goods, infrastructure and to foster economic activities, governments need funds which are collected through various means including taxation, foreign aid and borrowing. However, after the global financial crisis of 2008, it has been realized that domestic resource mobilization is the only sustainable and reliable way to finance such public expenditures (Fossat & Bua, 2013; Gordon, 2010; Keen, 2012). In this context, taxes of various kinds become important fiscal policy tools that are also used for stabilizing the economy and income redistribution (Wawire, 2017).

A good tax system should be efficient and equitable however, there seems a tradeoff between these two. This generated an ongoing debate over the optimal taxation theories (see Feldstein, 1973; Martimort, 2001). There is also rich literature on the relation between taxation and economic growth (see Engen & Skinner, 1996; Gemmell, 1988; Goulder & Summers, 1989; Lee & Gordon, 2005). These studies reach different conclusions while investigating the relationship. According to Auerbach (1996) and Eicher et al. (2003), these contradictory results are because of different socio-economic and political systems prevailing in different countries. Therefore, while developing a comprehensive, efficient and equitable taxation system, the governments must be cautious to take proper account of its macroeconomic and distributional impact (Sahn & Younger, 2000).

Now the taxation – economic growth relationship and the impact of tax reforms is analyzed in a comprehensive manner using general equilibrium approach by considering the interrelationships between all the sectors of economy. Such an analysis shows the complete picture of the economy and gauges the effects on any tax policy change on all the sectors of the economy. Unfortunately, we do not find any such study for Pakistan that discusses the relationship between various kinds of taxes and macroeconomic indicators and evaluates the various tax reform proposals by studying their impact of the economic growth, fiscal deficit, exports, and income. This study aims to fill this gap.

1.1 Scope of Research

The study aims identify and quantify the direction and magnitude of impacts of reducing marginal income tax rate, decreasing the number of slabs, and introducing a flat income and corporate tax rate with reduction in sales tax and custom duty etc. on the economy at both macro and micro level. This includes the effect of such changes on economic growth, private consumption, investment, government budget, sectoral impacts and labour income etc.

This is the first study for Pakistan that uses Computable General Equilibrium (CGE) model to analyze the proposed tax reforms, especially in income tax system. We utilized latest Input-Output (IO) table, updated Social Accounting Matrix (SAM) based on 2017 data by utilizing Labour Force Survey and Household Integrated Economic Survey (HIES) to make this analysis useful for policymakers to better understand the impacts of their policy proposals. This study will add to the debate on income tax issues in developing economies and thus its results will be useful for other developing countries to reform their taxation system.

The results show that with decreasing personal income tax only, by lowering marginal tax rates and reducing the number of slabs, the size of the economy as measured by real GDP may not increase in the long run though there will be an increase in private and government expenditures,

but exports will decline. However, if there is a reduction in all the taxes across the board, then GDP, private consumption, government consumption and exports will increase in both short as well as in long run. The income of the people will increase in both scenarios across all occupations as well. However, we feel that because of decrease in tax rates, fiscal deficit will increase and thus we believe that if government expenditures are also rationalized, the impacts could be even better, but these assumptions need to be tested.

The plan of the study is as follows. Section 2 presents brief review of the literature. Section 3 is on social accounting matrix followed by a section on CGE model. Section 5 presents results and discussion on the findings followed by the concluding session.

REVIEW LITERATURE

Recent literature has concentrated on studying the effects of fiscal stimulus through tax cut and increase in government expenditures on the economic and social indicators. Below is the brief review of selected studies.

Hamilton & Whalley (1989) evaluated the outcomes of various changes to Canadian indirect tax system using general equilibrium tax model. The results show an improvement in both the welfare and in the revenue collection by adopting a broad-based sales tax instead of federal or provincial sales taxes. Fortin et al. (1997) examine the impact of taxation and wage setting in a developing economy with an informal sector. Analysis using CGE model shows that increase in corporate taxes, payroll tax and minimum wage rate lead to growth in informal sector, in unemployment and in efficiency cost. Diao et al. (1998) used dynamic general equilibrium model to study various debt management policies for Turkish economy and concluded that although a reliance on indirect tax has distortionary effects and results in a loss of welfare yet this results in achieving fiscal targets.

Knudsen et al. (1998) studied the Danish tax reforms of 1993 using a dynamic CGE model. The simulations show that reducing taxes, the progressivity of the labor income taxation, and a restructuring of the capital income taxation results in accumulation of wealth and thus results in increasing the consumption. The reforms bring Pareto improvement. Damuri & Perdana (2003) studied the effect of 20% increase in government spending under different financing conditions on income distribution and poverty in Indonesia using comparative static CGE model. They found that if increase in spending has a significant and large positive impact on GDP if it is not followed by increase in taxes and financed through increase in loans. However, Begg et al. (2003) found contrary results as increase in spending financed by increased in income taxes showed an improvement in GDP through balanced budget multiplier effect. On same lines, Mabugu et al. (2013) studied the impact of 6% increase in government spending on South Africa's economy using dynamic CGE model. They concluded that increase in government spending result in increasing the GDP no matter if it is financed through increase in income tax, output tax or in all the taxes.

Mountford & Uhlig (2009) analyzed the impact of changes in tax on the economy and concluded that an unanticipated deficit-financed tax cuts stimulates the economy in short term. However, the growing deficit may have consequences in long run which overweight the short-term gains. Cororaton & Orden (2009) using CGE model show that for Pakistan, the impact of overall trade liberalization on poverty reduction is higher than the impact of trade liberalization in agriculture sector only. Romer & Romer (2010) found that tax changes have very large effects on output and investment. Particularly, they show that an exogenous tax increase of one percent of GDP lowers real GDP by approximately three percent. Amir et al. (2013) identified and quantified the impacts of income tax reforms on Indonesian economy through key macroeconomic and socio-economic. The results of CGE model show that reducing income tax and introducing a low and flat tax rate for corporate tax will lead to economic growth and poverty reduction.

Gale & Samwick (2014) suggest that though the tax cuts may encourage individuals to work, save, and invest more, but such policy must be backed by spending cuts to avoid large deficits. Otherwise it may result in reducing national savings, increasing interest rates and thus a drop-in investment in long run. Hasudungan & Sabaruddin (2016) investigated the impact of choosing

between increasing borrowing to support increased government expenditures or simultaneous increase in both borrowing and exogenous output tax rates or to reduction in subsidies; on Indonesian economy using CGE model. The simulations show that first proposal improves GDP but also increases fiscal deficit whereas the other two alternatives result in lowering GDP because both result in increasing the cost of production and thereby resulting in inflation and fall in consumption.

Huang & Rios (2016) derive the framework for optimal taxation when households are involved in tax evasion. The paper derives the mix of linear optimal consumption and non-linear optimal income tax for the redistribution purpose. It is assumed that consumption taxes are forceable while the income taxes can be evaded. To achieve the goal of income redistribution in the economies with low compliance, the two tax instruments are complementary. As the social planner puts more weight on the lower ability households, the income tax becomes more progressive, but the optimal consumption tax rate also increases because of higher evasion at higher marginal tax rates.

Hussain & Malik (2016) investigated the asymmetric response of output to changes in average marginal tax rates using Romer & Romer (2010) data and found that the only a tax decrease results in significant and permanent increase in output whereas the increase in tax has no significant impact. Using a simple model, it is shown that this asymmetry is derived by asymmetric response of consumption of individuals to change in taxes as households face asymmetric consumption adjustment costs. Bhattarai & Trzeciakiewicz (2017) developed a DSGE model and analyzed the fiscal policy in UK. The findings show that public consumption and capital income tax are the most effective fiscal tools in short and long run respectively, whereas public investment is effective in both short and long run and transfer payments are the least effective tool. On the other hand, when interest rate falls to zero lower bound, the effectiveness of consumption taxes and public expenditures increases, and the income taxes become least effective. The analysis also showed that non-Ricardian households make fiscal policy more effective and nominal rigidities enhance the effectiveness of public spending and consumption taxes and decrease the effectiveness of income taxes.

Giraldo & García (2018) examined the effects of changes in tax system on economic growth, welfare and income distribution in Colombian economy using a CGE model. Considering three alternatives of increasing the VAT, extending VAT to all products or to decreasing the corporate income tax by 20% and a progressive income of the tax rate on wealthy people, they found that increase in indirect taxes will not have large significant impact on the welfare of low-income households and taxing the result of production. Mertens & Montiel Olea (2018) provided empirical evidence that a cut in marginal tax rates results in increase the output and decreasing the unemployment. Belayneh (2018) examined the impacts of a cut in direct taxes on macroeconomic variables, fiscal balance, income distribution and welfare of households using dynamic CGE model. The simulations show that such a reform will result in increasing the income of the households however, the non-poor urban households will enjoy more benefits. The manufacturing sector will receive more benefits from such reform than any other sector of Ethiopian economy.

Abdisa (2018) studied the reaction of major macroeconomic indicators of Ethiopian economy because of tax reforms using Dynamic CGE model. The results show that reducing direct tax or increasing the sales tax will boost overall economic activity whereas reducing tariff will have negative consequences. Lin & Jia (2019) analyzed the impact of taxes on energy production

sectors on energy, CO_2 and the economy of China using dynamic recursive CGE model and found that tax rate in the ad valorem tax system effects GDP negatively while the tax rate in specific and fixed tax have limited positive relation with GDP. Switching to fix tax system will also result in decreasing the inflation. Nandi (2020) proposed and calibrated a DSGE model for Indian economy to study the impact of fiscal policy shocks. The results show that GDP and employment are positively related with government spending, negative consumption tax reduces inflation and induces consumption while negative labor income tax has an asymmetric effect on economy. Results also show that increase in public investment do not crowd out private investments.

The US Senate approved a new tax plan, that reduced almost all kinds of taxes. The supporters of this move say that the workers will enjoy higher wages while the opponents are of the view that reduction in government expenditure because of this will be costly for workers. Using Romer & Romer (2010) average marginal tax rate data, Berisha (2020) studied the response of "middle-class" workers' earnings to these changes. The results suggest that a one percentage point increase in tax liabilities (relative to GDP) leads to about a 1.5% decrease in real GDP growth and a 0.5% decrease in median weekly earnings. However, the direct effect of decreasing taxes on median weekly earnings is not statistically significant. The outcomes also suggest that deficit-driven tax increases contribute to lower median weekly earnings.

This review of selected literature shows that most of the economists view that the fiscal stimulus results in increasing the GDP and decreasing in poverty. However, the choice of mechanism is critical, and the optimal choice depends on the individual economy's conditions. Moreover, we find only a few studies on Pakistan and even those are very limited in scope. For example, the study of Iqbal et al. (2019) is limited to the impact of GST on household consumption pattern only, the focus of Ahmed et al. (2011) study is on GST only and it is conducted by using SAM for 2004 which is quite old now, and Naqvi et al. (2011) covers agricultural income tax only by using SAM 2001-02. A comparative study of different income tax rate proposals that examines the impact on key economic variables of Pakistan economy is missing and this study aims to fill this gap.

SOCIAL ACCOUNTING MATRIX 2017

Social Accounting Matrix (SAM) is one way to represent the economy. It is based on single entry accounting system, which assigns values to the incomes and expenditures in the circular flow diagram and thus records all the transaction in an economy (Breisinger et al., 2009; Dorosh et al., 2004). It is an extended form of national accounts in which different activities employ factors of production to produce various commodities, earn revenues or income by selling these commodities and make expenditures in form of payment to factors, government and to related industries. Similarly, households who own the factors of production spend their income in buying commodities and government earns taxes which are spent back on households and commodities. Mathematically, a SAM is a square matrix each row and column of which represents an account and each cell shows an expenditure make by column account to purchase the goods or services of row account. The income – expenditure equality is maintained in the SAM. Thus, on one hand, macroeconomic consistency is maintained and on the other, details about income of the factors, expenditures of the households and production of various goods and services are also recorded. Rich multisectoral data helps policy makers to quantify the impact of change in a policy on various sectors of the economy (Robinson et al., 2001).

Building a SAM requires collecting data from various sources such as input – output (IO) tables, national accounts data, desegrated data of balance of payment and fiscal account, household income and expenditures surveys and labour force surveys etc. The rich information gathered from all these resources captures heterogeneity of production activities, incomes and expenditures. This strongly interconnected information helps policy makers to perform structural analysis and allows to study the distributional impact of a change in a policy parameter.

The objective of this study is to construct an updated and highly desegregated SAM that can be used for various policy analysis by the policy makers and researchers. First, we present a review of literature and discuss previously developed SAMs for Pakistan, then we elaborate the step by step methodology adopted to construct this SAM based on data for financial year 2017 and in the last part we did some analysis based on the SAM 2017.

3.1 Literature on SAM (Pakistan Specific)

First social accounting matrix for Pakistan economy was constructed in 1985 by Pakistan Institute of Development Economics (PIDE). The base year for this SAM was 1979. Federal Bureau of Statistics in collaboration with Dutch government, produced second SAM for Pakistan in 1993 which was constructed on the base of 1984-85. It was the one of the outputs of research project aimed at improving the national accounting system of Pakistan. This SAM had one household only and therefore it was not suitable for distributional analysis.

Siddiqui & Iqbal (1999) developed a comparatively large sized SAM in which factor account consisted of labour and capital. Total production of the economy was desegregated into agriculture, industry, health, education, and other sectors with each sector participating in local and global markets. Two factors of production were owned by eight various types of households. The record of international trade was recorded in capital account. This SAM was based on 1989-90 statistics. Though this SAM presented some disaggregation of the economy, which was helpful for distributional analysis; however, the detailed breakdown of the firms on the basis of various

production activities and of the factors of production based on different skill level of workers was missing.

Dorosh et al. (2004) developed SAM for year 2001 – 02. This was specially developed to analyse rural economy. It composed of 34 activities, 33 commodities, 27 classifications of factors of production, including land, labour and other factors. It consists of 17 rural and 2 urban households, firms, government, and rest of the world. However, this SAM used same IO table as was used by Siddiqui & Iqbal (1999). Since it was developed for the analysis of rural economy, so its main segregation was based on that objective and therefore, it provided very detailed information about the rural economy, but decomposition of various industrial productive activities and labours based on the skill set they have was missing.

Waheed & Ezaki (2008) constructed another SAM using 1999-00 as base year and exploiting the same IO table. They expanded sectors and brough in financial institutions as well. Their developed SAM also had two factors of production, labour and capital, six production sectors. The agents consisted of household, firm government, commercial bank, central bank and rest of the world. This SAM integrated financial sector with the real sector, but segregation of households and production sector was missing therefore it was not very useful for distributional analysis.

Debowicz et al., (2012) worked on SAM for year 2008 – 09 following the SAM 2001 – 02 style. This same consisted of 12 agriculture activities (Same as in SAM 2001 – 02), segregated textile and chemical industry to make a total of 22 industrial activities. Similarly, trade, transportation sector, house and private sector services were also further classified. The division of commodities and rural households was same as in SAM 2001 – 02 but urban households were divided into three groups based on their income. Similarly, in institutional accounts, separate subaccounts were introduced for import taxes, direct taxes, and sales taxes.

Zeshan, Muhammad (2020) developed SAM for Pakistan based on the year 2014. This SAM includes 65 activities, producing same number of commodities. However, the desegregation is quite detailed for agriculture sector but not as detailed for industrial or services sector. There are 3 factors of production, unskilled labour, skilled labour and capital. Similarly, tax desegregation is also limited to production taxes, trade tax and direct taxes only. However, quite detailed breakdown of Rest of the World account makes it ideal to use for multi-country analysis.

3.2 Parts of SAM

Main parts of a social accounting matrix are activities and commodities, domestic institutions, saving and investment and rest of the world. Each of these parts is composed of many parts which together make the whole SAM. These parts are elaborated in followings.

By activities, we mean the producers of various goods and services and by commodities we mean the goods and services produced. These are distinguished as an activity may produce more than one good, for example agriculture activity can produce wheat, rice, cotton, pulses etc. Similarly, a commodity can also be produced by more than one activity, like shoes can be produced by a small shoe making firm and a large shoe making firm. Therefore, the separation of the two provides better information.

An activity uses intermediate inputs produced by other activities and produces final commodity with the help of factors of production. These factors receive payment in form of wages and rent etc as per their contribution in producing the commodities. Similarly, payment is also made to commodities for the use of intermediate inputs. Commodities, on the other hand, are supplied either by domestic activities or are imported. Indirect taxes like sales tax and taxes on import like import tariffs are paid on these commodities to the government. Therefore, the values in commodity accounts are measured at market prices.

The information needed to construct detailed activities and commodities accounts usually comes from input-output table, national accounts data and some research on the share of various factors, or value added by the factors.

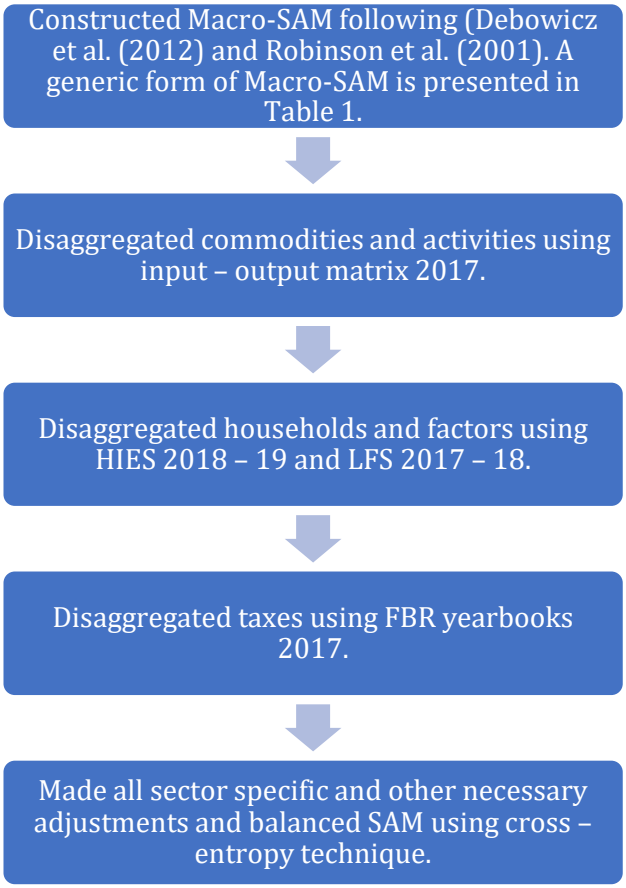
One aspect that differentiates a SAM from an I-O table is that a social accounting matrix besides recording the flow of income and expenditures between activities and commodities, but also gives information about the income and expenditures of various institutional accounts such as households and government. Households usually own the factors of production and earn income by supplying these factors. Households may also receive some income from the government in form of transfer payments and from foreign in form of remittances. On the expense side, households pay direct taxes to the government and make payment to commodities for consuming these. The leftover income is saved. Different direct and indirect taxes are the income of the government. Other than this, government may hold some capital and may also engage in some production activities and earn income from those. A part of government income also comes from foreign in terms of aid, grants and development assistance. Government spends this income on making payments to factors it hired, to make transfer payments or subsidies to households or activities and the remaining amount, usually in negative, is recorded in savings and investment account. The information on household account is usually found in national income accounts and household surveys which are normally held regularly.

Investment comes from public savings, which is the sum of private and public savings. However, in open economies like the one we have, investment also comes from foreigners' savings. The information on capital inflow from the rest of the world comes from balance of payment accounts usually published by the central bank of the country.

Steps to Build a SAM

The Macro-SAM is based on the information from National Income Accounts, Handbook of Statistics on Pakistan Economy 2020 and FBR Year Books. These sources are published by Finance Ministry, State Bank of Pakistan and Federal Board of Revenue Pakistan respectively. In line with Debowicz et al. (2012); Golan et al. (1994, 1997) and Robinson et al. (2001) Throughout the work, Bayesian view of efficient use of information is followed.

Figure 1: Building SAM



Current SAM

In developing SAM based on financial year 2017, we used information on accounts from Debowicz et al. (2012); Dorosh et al. (2004) and Zeshan, Muhammad (2020). Debowicz et al. (2012) disaggregated agriculture sector in various sub-categories with respect to the crop and farm size and the location. Similarly, the activities in allied industries like textiles, trade and transport and in services were also disaggregated. In current SAM, we do not split agriculture with respect to crops, however we introduced mining and food, beverages and tobacco separately because of different tax treatment to them. Similarly, we do not split textile and clothing into various sub-categories instead we disaggregated other manufacturing into various categories such as electrical and optic equipment, rubber and plastic, chemical and chemical products, and paper, printing and publishing etc. Similarly, instead to rail and road transport, we used inland transport and defined other means of transport as water transport and air transport and introduced transport supporting activities, such as the services of travel and transport agencies separately. Beside common public and private services like of education, health care, public administration, we also introduced hotel and restaurant services as these represent growing tourism and hospitality industry. For most of the disaggregation such as these described above, Input-Output table 2017 is used and main objective of this disaggregation was to facilitate industry related analysis such as of change in tax etc. Final SAM 2017 includes 34 commodities produced by 34 activities with detailed disaggregation of industries and services sectors but limited segregation of agriculture sector. Detailed interconnections between various kind of industries help gauging the impact of change in any such policy on various sectors and thus on overall economy.

Next, we introduced 24 factors. Two basic economic factors of production, labour and capital are divided into three categories, low skilled labour, high skilled labour and capital. These three categories were further splited into rural and urban geographies of all the four provinces. For this, information from Zeshan, Muhammad (2020), Household Integrated Economic Survey (HIES) 2017-18 and Labour Force Survey (LFS) 2017 is used. Specially, the wage differences among skilled and skilled labour in rural and urban areas of four provinces is calculated from Labour Force Survey. The non-labour income is used as capital income.

We introduced 8 categories of households based on rural – urban divide in each province. These eight types of households own 24 factors of production i.e., each household own one skilled labour, one unskilled labour and one unit of capital. However, some of the capital being used in the production process is also supplied by rest of the world or by the government as well. The households earn income equal to the value added of these factors of production they own. Remittances from foreign and transfer payments from government are the other sources of income for these households. Out of their income, they pay direct tax to the government, pay firms for consuming their goods and services and the leftover income is saved.

Government earns income by collecting tax revenue. Various kinds of taxes are basically of two types – direct tax and indirect tax. While developing current SAM, we considered various direct and indirect taxes such as sales tax on goods, sales tax on services, custom duty, excise duty, income tax on individuals, firms and associate of persons etc. Besides these taxes, government also receives income against the capital it owns and also receives loans, aids and grants from domestic and foreign financial institutions and agencies. On expenditure side, government provide public goods administration to the general public which needs various commodities as inputs. Similarly, government needs services of various factors of production to enable itself to produce and supply public administration. It makes transfer payments and gives subsidies to households and firms. Along with all these, some of the government expenditures are because of the debt servicing. These expenditures include interest and principal payments to local and foreign financial institutes. The different between government income and expenditures is called as budget surplus (if it is in positive) or budget deficit (if it is in negative) which is recorded as public savings. The information on all such incomes and expenditures is obtained from FBR Yearbook 2017, National Income Accounts and Handbook of Statistics on Pakistan Economy 2020.

Rest of the world account records the flow of funds from and to foreign countries. These include payments made against imports from foreign countries, payments received from foreign against exports, flow of remittances and capital payments as well as flow of savings and loans, grants and aid. The information on all these is obtained from Balance of Payment (BOP) account published by the State Bank of Pakistan (SBP), National Income Accounts published by Finance Ministry, trade statistics published by SBP and Pakistan Bureau of Statistics (PBS). While developing current SAM, we did not disaggregate this account, however it can be done using IO table and information from above cited sources.

After cross checking each value from multiple sources and making tedious efforts to minimize the row - column sum differences, we used Cross Entropy approach following Golan et al. (1994, 1997); Judge & Mittelhammer (2011) and Robinson et al. (2001).

Table 1: A Generic Schematic SAM

	Activities	**Commodities**	**Labour**	**Cap**	**Households**	**Govt**	**Change in Stock**	**Saving**	**ROW**
Activities		Supply Matrix							
Commodities	Intermediate				Final Pvt Cons.	Final Pub Cons.	Change in Stocks	Fixed investment	Exports
Labour	VA by Labour								
Capital	VA by Capital								
Households			Payment from lab	Payment from cap to household		Transfer from govt to			Remittances to household
Govt		Indirect taxes		Payment from capital to Govt	Direct tax				Transfer from non-residents to Govt
Changes in stocks								Change in stocks	
Saving and Investment					Household savings	Public savings			Foreign Savings
ROW		imports		Repatriation of Dividends		Payment to non residents			

Based on Robinson et al. (2001) and D. Debowicz et al. (2012)

3.3 Structure of the Economy

A SAM gives very useful information which is helpful for understanding the structure of the economy. In this section we share some economic insights from the social accounting matrix.

Value Added Shares of Factors of Production

Table 2 presents the value-added share of various factors of production. This value-added breakup shows that Pakistan is a labour-intensive economy. The share of mining, metals, and chemical sector is most capital-intensive sector. In this sector, 59.94% share of value added goes to capital and out of remaining, 13.07% goes to skilled and 26.99% goes to unskilled labour. Agriculture and food is the most labour intensive sector in which 66.69% of the value-added goes to labour and out of remaining 13.21% goes to rural capital and 20.10% goes to urban capital. The share of skilled labour is highest in services sector (38.41%) and lowest in agriculture and food sector (8.21%) whereas the share of unskilled labour is highest in agriculture sector (58.48%), followed by textile, leather, and rubber sector (41.38%).

Table 2: Value Added Shares

	Capital (Urban)	**Capital (Rural)**	**Skilled Labour (Urban**	**Skilled Labour (Rural)**	**Unskilled Labour**	**Unskilled Labour**	**Total**
Agriculture & Food	20.102	13.205	5.458	2.753	39.343	19.138	100
Textile, Leader &	23.414	15.381	12.291	7.533	25.838	15.543	100
Mining, Metals &	36.173	23.763	7.720	5.353	15.670	11.321	100
Construction & Energy	23.105	15.178	12.918	9.213	23.181	16.404	100
Other Manufacturi	23.776	15.619	14.533	9.766	21.736	14.571	100
Trade	29.542	31.628	11.432	7.804	11.471	8.122	100
Transport & Communicat	29.581	19.432	11.677	9.255	16.750	13.305	100
Other Services	27.200	17.868	21.523	16.888	9.479	7.042	100

These findings clearly show that urban labour and capital receive higher income than rural. This is because most of the industries, high paying market activities and skilled jobs are available in urban areas whereas the economic activity in rural areas is mostly centred around agriculture activities. Similarly, most of the labours in Pakistan are low skilled labours therefore, collectively they earn higher than skilled labour. However, this also shows the limited ability of the economy to produce higher value-added products that require greater use of technology and skills. This drawback is one of the reasons of low earnings of the people, and poor economic growth of the country.

Sectoral Trade Shares

Pakistan is an open economy. As shown in the Table 3 below, textile, garments, leather and rubber is the largest exporting sector of Pakistan economy with 48.73% share in total exports whereas construction and energy sector is the most import dependent sector which shares 30.58% of imports. This is because Pakistan relies on imports for its energy needs, especially for oil and gas. The other prominent sectors that strengthen Pakistan's link with the world through trade are agriculture and food, mining, metals and chemical, trade services and transport and communication. Agriculture and food sector has 19.85% share in total exports and 14.66% share in imports. Pakistan exports fruits, vegetables and rice etc. and imports edible oil, packed juices and dry milk etc. similarly, transport and communication sector has an import share of 16.01% and export share of 6.19%.

Table 3: Trade Share of Each Sector

	Agriculture & Food	**Textile, Leader & Rubber**	**Mining, Metals & Chemical**	**Construction & Energy**	**Other Manufacturing**	**Trade**	**Transportation & Communication**	**Services**
Import	14.66	7.46	18.21	30.58	4.29	3.31	16.01	5.49
Export	19.85	48.73	6.21	0.58	2.47	10.39	6.19	5.59

Note: Calculated by the Author.

INTERMEDIATE AND FINAL DEMAND

Table 4, given below, shows the share of intermediate and final demand for each sector. Intermediate demand means the quantity of goods and services that is used in the production process. Table 4 given below shows that out of the total output of mining, metals and chemicals sector, 94.71% is used up as intermediate demand by other industries and the remaining is sold to final consumer. The share of intermediate demand and final demand is 93.02% and 6.98% out of the output produced by construction and energy sector.

Table 4: Demand Breakup (In Percentage)

	Agriculture & Food	**Textile, Leader & Rubber**	**Mining, Metals & Chemical**	**Construction & Energy**	**Other Manufacturing**	**Trade**	**Transportation & Communication**	**Services**
Intermediate Demand	85.906	84.556	94.708	93.022	79.432	91.460	87.604	81.082
Final Demand	14.094	15.444	5.292	6.978	20.568	8.540	12.396	18.918

Note: Calculated by the Author.

COMPUTABLE GENERAL EQUILIBRIUM MODEL

To study the impact of various policy interventions on Pakistan Economy, researchers utilized differently developed Computable General Equilibrium (CGE) models. Siddiqui & Iqbal (2001) developed CGE model for Pakistan and used that to analyses the impact of tariff reduction. Same model was used by Siddiqui et al. (2008) for studying the impact of fiscal and trade policy changes on poverty. Ahmed et al. (2011) used CGE model developed by Poverty and Economic Policy (PEP) Research Network to examine the impact of changes in indirect taxes in Pakistan. Khan et al. (2018); Shaikh (2009) and Shaikh & Rahpoto, (2009) used Global Trade Analysis Project (GTAP) model to investigate the effects of various trade related policies on Pakistan economy. Robinson & Gueneau (2013) used basic CGE model developed by International Food Policy Research Institute (IFPRI) and extended it for exploring the impact of changes in water resources in the Indus River specially focusing on the impact of water shocks on Pakistan economy.

Main inspiration for developing a CGE model for this study are based on ORANI-G (J. Horridge, 2000; M. Horridge, 2003), Applied General Equilibrium Model for Fiscal Policy Analysis (AGEFIS) by Yusuf et al. (2007), Amir et al., (2013), Siddiqui & Iqbal (2001) and Siddiqui et al. (2008). ORANI-G is generic CGE model developed for various kinds of policy analysis, and it is being used in many countries with slight modifications whereas AGEFIS is a CGE model based on SAM unlike ORANI-G which is based on IO table, specially developed for conducting fiscal policy analysis, which is aligned with the objectives of current study. The last two studies clarify relevant modifications needed for specifying Pakistan economy. Main differences between the CGE model developed for this study and one earlier developed by Siddiqui & Iqbal (2001) are that in previously developed model domestic production is divided into five sectors, whereas in current model we divide it in 34 sectors, labour is assumed to be homogenous in the model of Siddiqui & Iqbal (2001), whereas in our model we introduce sixteen (16) different types of labour based on geographical local and skill level and eight (8) categories of capital. Similarly, we also we introduced eight different types of households based on rural urban localities of each province whereas the older study includes only one household. Other changes are also mentioned at relevant places. Because of these additions, we believe that current model is more flexible as it can show mobility of labour and capital between different areas and sectors, the kind of labour – low skilled or high skilled – being chosen by different industries, the labour – capital intensity of various sectors, rate of unemployment and wage rigidities. Since labour income is major share of household earnings therefore, ability to study these labour market adjustments is an important addition to the model. Moreover, the model may also be used for analysing the impact of various policies on poverty and income inequality.

Following other CGE models such as P. Dixon (2006); P. B. Dixon et al. (1982, 1992) and P. Dixon & Rimmer (2002), the equations of the model are linearised using percentage changes based on Johansen approach, instead of the levels of variables. Moreover, for each component of demand, the price formation process is described in various factors such as basic value, margin, and taxes etc. for each component of demand. Main features of the model, such as dimensions of the model and equation system and model closure are discussed in following subsections.

4.1 Dimensions of the Model

This model consists of 34 commodities which are produced by similar number of activities or industries and are also imported from the rest of the world. The commodity set is further divided

into margins and non-margins. Margins are the commodities such as wholesale and retail trade, transportation, and supported services whereas non-margins are the rest of commodities. Details on the sets of the model are summarized in the Table 5 below.

Table 5: Details of Sets

Commodities (COM) and Activities (IND)		**Margins (MAR)**	
1	Agriculture, Hunting, Forestry, and Fishing	1	Sale, Maintenance, and Repair of Motor Vehicles and Retail Sale of Fuel
2	Mining and Quarrying	2	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
3	Food, Beverages, and Tobacco	3	Retail Trade, except Of Motor Vehicles and Motorcycles; Repair of Household Goods
4	Textiles and Textile Products	4	Inland Transport
5	Leather, Leather Products, and Footwear	5	Water Transport
6	Wood and Wood Products	6	Air Transport
7	Pulp, Paper, Paper Products, Printing, and Publishing	7	Other supporting and auxiliary transport activities
8	Coke, Refined Petroleum, and Nuclear Fuel	**Source (SRC)**	
9	Chemicals and Chemical Products	1	Domestic
10	Rubber and Plastics	2	Imported
11	Other Non-metallic Minerals	**Occupations (OCC)**	
12	Basic Metals and Fabricated Metal	1	Pun-r-low skilled
13	Machinery	2	Pun-r-high skilled
14	Electrical and Optical Equipment	3	Pun-u--low skilled
15	Transport Equipment	4	Pun-u--high skilled
16	Manufacturing, and Recycling	5	Sin-r-low skilled
17	Electricity, Gas, and Water Supply	6	Sin-r-high skilled
18	Construction	7	Sin-u--low skilled
19	Sale, Maintenance, and Repair of Motor Vehicles and Retail Sale of Fuel	8	Sin-u-high skilled
20	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	9	KP-r-low skilled
21	Retail Trade, except Of Motor Vehicles and Motorcycles; Repair of Household Goods	10	KP-r-high skilled
22	Hotels and Restaurants	11	KP-u--low skilled
23	Inland Transport	12	KP-u-high skilled
24	Water Transport	13	Bal-r-low skilled
25	Air Transport	14	Bal-r-high skilled
26	Other supporting and auxiliary transport activities	15	Bal-u-low skilled
27	Post and telecommunications	16	Bal-u-high skilled
28	Financial intermediation	**Capital (CAP)**	

29	Real estate activities	1	Pun-r
30	Renting and other business activities	2	Pun-u
31	Public administration and defence	3	Sin-r
32	Education	4	Sin-u
33	Health and social work	5	KP-r
34	Other community, social, and personal services	6	KP-u
Households (HOU)		7	Bal-r
1	Pun-r	8	Bal-u
2	Pun-u		
3	Sin-r		
4	Sin-u		
5	KP-r		
6	KP-u		
7	Bal-r		
8	Bal-u		

4.2 Naming System

To name variables, parameters and coefficients of CGE model for current study, following conventions are used:

Table 6: Name System

Symbol	Full Name	Symbol	Full Name
a	Change of technology	Bas	Basic – not including margins
del	Ordinary Change	Cap	Capital
f	Shifting Variable	Cif	Imports at border prices
p	Price in Local Currency Unit (LCU)	Imp	Imports (duty paid)
pf	Price in foreign currency	Lab	Labour
S	Share of input	lux	LES (supernumerary part)
SIGMA	Elasticity of Substitution	mar	Margins
t	Tax	**oct**	**Other Cost Tickets**
V	Value in LCU	prim	primary factors of production
w	Percentage-change value in LCU	pur	At purchasers' prices
x	Input Quantity	**sub**	**LES (Subsistence part)**
_c	Over COM	Tar	Tariffs
_s	Over SRC (local + Imp)	tax	Taxes (indirect)
_i	Over IND	tot	Total (average) inputs for some users
_io	Over IND and OCC		
_o	Over OCC		
_gi	Over CAP		

These conventions are adopted as these matches with GEMPACK system.

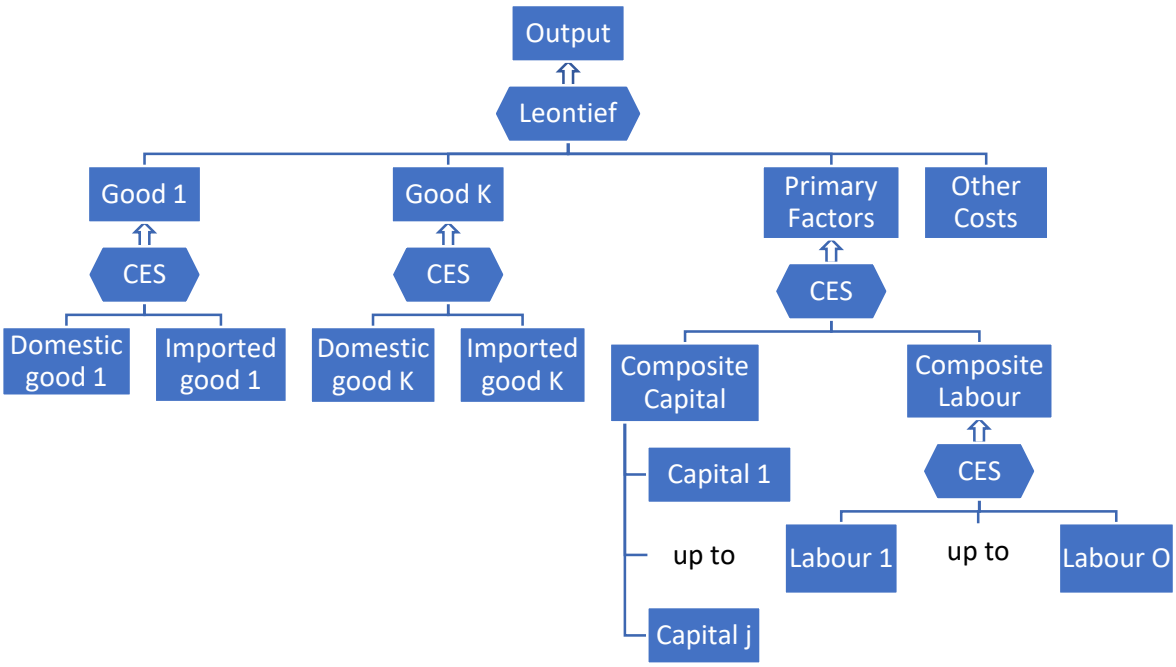
4.3 Production Block

In this model, 34 commodities are produced by 34 activities or industries. So, all the industries are single output producing industries. The input required to produce output consists of local or imported commodities, factors of production and other inputs. Factors of production include eight types of capital and sixteen types of labour. Nesting structure of the model is presented in the Figure 1 below.

The process represented in Figure 1 shows that production is a multistage process. The top nest the output is produced using intermediate commodities as inputs, factors of production and other cost such as taxes, subsidies etc. At this stage, the production process can be expressed using Leontief technology according to which, all the inputs are combined in a fixed proportion to produce the output. Therefore, excess supply of one or few inputs will not guarantee higher output.

At the lowest stage, a nest represents that composition of intermediate inputs. The intermediate inputs may be domestic or imported. This choice of imported or domestic intermediate inputs depends on various factors such as prices in local and import market and elasticity of substitution between the locally produced and imported input which follows constant elasticity of substitution (CES) parameter. All these decisions follow cost minimization principle while choosing local and domestic markets using Armington assumptions (Armington, 1969). In second nest, the cost of primary factors is minimized using CES function as well. Here also we assume that a costly input will be substituted by a cheaper input. Both of the primary factors, composite labour and composite capital are also formed using cost minimization from various types of labour and capital which, for this study, we keep 16 for labour and 8 for capital.

Figure 2: Production Structure



The equation that represents this production structure can be written as

$$\mathrm{X1TOT(i)} = \frac{1}{\mathrm{A1TOT(i)}} \mathrm{MIN}\left(\mathrm{All, c, COM}\ \frac{\mathrm{X1\_S(c,i)}}{\mathrm{A1\_S(c,i)}}, \frac{\mathrm{X1PRIM(c,i)}}{\mathrm{A1PRIM(c,i)}}, \frac{\mathrm{X1OCT(i)}}{\mathrm{A1OCT(i)}}\right) \quad (4.1)$$

The A1TOT(i) represents Hicks-neutral technical-change term.

The choice of using imported or local commodities as intermediate inputs can be represented as

$$\mathrm{X1\_S(c,i)} = \mathrm{CES}\left(\mathrm{All, s, SRC:}\ \frac{\mathrm{X1(c,s,i)}}{\mathrm{A1(c,s,i)}}\right) \quad (4.2)$$

The demand for primary input factors which follows cost minimization principle subject to production function, is

$$\mathrm{X1}PRIM(i) = \mathrm{CES}\left(\frac{\mathrm{X1LAB\_O(i)}}{\mathrm{A1LAB\_O(i)}}, \frac{\mathrm{X1CAP\_CA(i)}}{\mathrm{A1CAP\_CA(i)}}\right) \quad (4.3)$$

The demand for labour and capital from various kinds of labour and capital can be represented by

$$\mathrm{X1}LAB\_O(i) = \mathrm{CES}(All, o, OCC: X1LAB(i, o)) \quad (4.4)$$

And

$$\mathrm{X1}CAPT\_CA(i) = \mathrm{CES}(All, o, CAPT: X1CAP(i, o)) \quad (4.5)$$

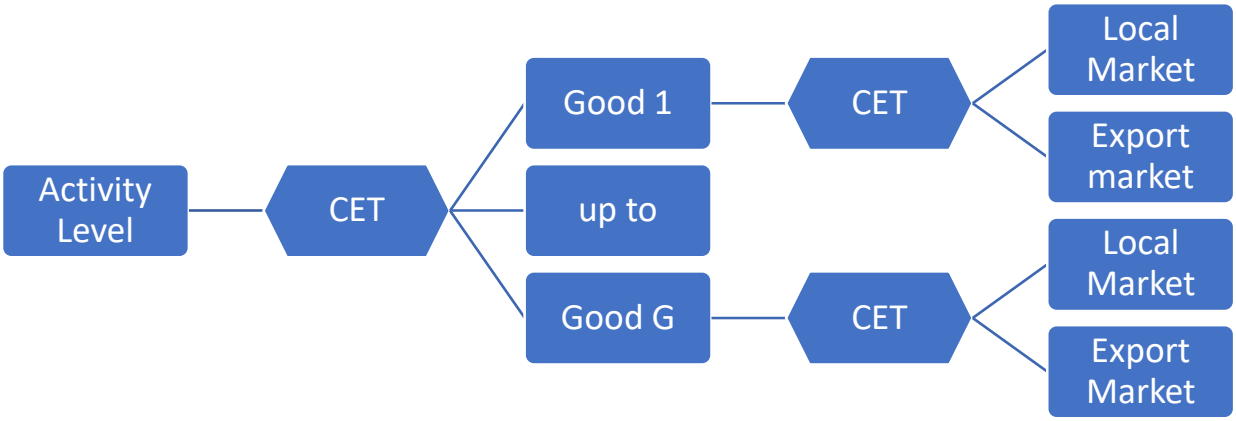
4.4 Commodity Output Block

In social accounting matrix and subsequently in CGE, a commodity can be produced by more than one industry and an industry can also produce more than one commodity. In such case, an increase in the relative price of a commodity stimulates firms to transform their production in a way to produce more output of that commodity but because of competitive market, the price of final good produced by any firm is almost the same. Moreover, for each industry, the input mix may not be the same. Therefore, the model should be flexible enough to incorporate this and thus analyse a policy change in such settings. An industry seeks to maximize total revenue given the production function. This can be represented as

$$\mathrm{X1}TOT(i) = \mathrm{CES}(All, c, COM: Q1(c, i)) \quad (4.6)$$

Constant elasticity of transformation (CET) and constant elasticity of substitution (CES) functions are identical expect for the sign of substitution parameter, which is opposite in case of CET aggregation function. The composition of output is also represented in the following diagram:

Figure 3: Composition of Outputs, adopted from M. Horridge (2003)



In present study, each commodity is produced by one industry only, therefore all off-diagonal elements of multiproduction matrix (MAKE) are zero.

Firms can sell their output in local or export market. However, it is also possible that the goods produced for two markets are differentiated. This possibility is taken care by using CET function and setting TAU, which is the reciprocal of elasticity of transformation between export and local market, equal to zero. Following equation presents the total revenue or total sale

$$\mathrm{V1}TOT(i) = \mathrm{SALES(c)} = \sum_{i} MAKE(c,i) = \mathrm{DOMSALES(c)} + \mathrm{V4BAS\ (c)} \qquad (4.7)$$

4.5 Final Demand Block

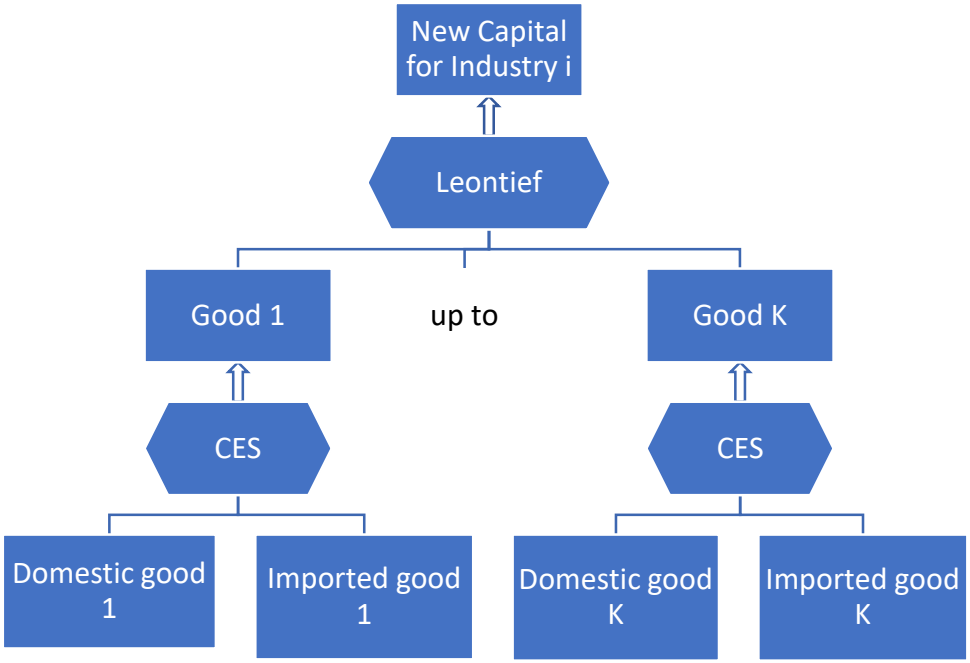
This block consists of demand for investment by firms, demand for goods by households, demand by rest of the world which represents our exports, demand by the government and for inventories. Inputs from domestic and imported commodities are used in producing capital. Like production function, the demand for investment is also nest structured in which in the lowest nest, cost of local and imported commodities in minimized subject to production function and at the top level, the total cost of commodity composite is optimized against given constraint of Leontief production function. This is represented in following two equations and Figure 4.3.

$$\mathrm{X2\_}S(c,i) = \mathrm{CES}\left(All, s, SRC: \frac{\mathrm{X2(c,s,i)}}{\mathrm{A2(c,s,i)}}\right) \qquad (4.8)$$

And

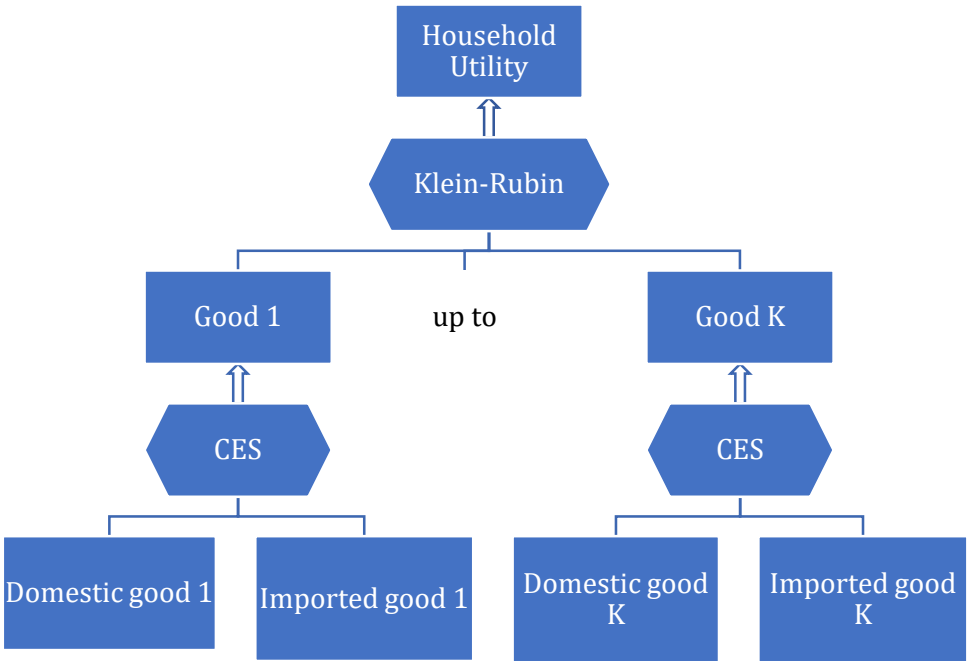
$$\mathrm{X2}TOT(i) = \frac{1}{\mathrm{A2TOT(i)}}\mathrm{MIN}\left(All, s, COM: \frac{\mathrm{X2\_S(c,i)}}{\mathrm{A2\_S(c,i)}}\right) \quad (4.9)$$

Figure 4: Investment Demand (Amir et al., 2013; M. Horridge, 2003)



Households also demand goods and services for their consumption. Each of the household in the model aims to maximize utility within its own budget constraint. The nested structure of household demand is similar to investment demand function but instead of Leontief technology, we assumed Klein-Rubin utility function which further leads to linear expenditure function (LES). This is represented in Figure 4.4 below.

Figure 5: Household Demand for Commodities (J. Horridge, 2000)



As per Klein-Rubin utility function, a household first consumes subsistence quantity of each good which does not depend on the price (X3SUB(c) in the following equation) and then allocates remaining budget (S3LUX(c) on the other goods. This is shown as

$$Utility\ per\ household = \frac{1}{Q}\prod[X3\_S(c) - X3SUB(c)]^{S3LUX(c)} \quad (4.10)$$

Where household's total demand for composite commodity, represented by $X3\_S(c)$ is

$$X3\_S(c) = X3SUB(c) + S3LUX(c).\frac{V3LUX\_C}{P3\_S(c)} \quad (4.11)$$

and

$$V3LUX\_C = V3TOT - \sum_i [X3SUB(c).P3\_S(c)] \quad (4.12)$$

Export Demand

Exports demand is categorized into individual export demand which is negatively related to the price of the commodity, and it includes all main export commodities. The other category is collective demand which is in inverse relation with the average price of all export commodity. The equation specifying negatively slopped demand for the commodities categorized as individual export demand is

$$X4(c) = F4Q(c)\left[\frac{P4(c)}{PHI.F4P(c)}\right]^{EXP\_ELAST(c)} \quad (4.13)$$

Where EXP_ELAST(c) is a negative parameter – constant elasticity of demand, X4(c) is export volume and term in bracket is the prices in foreign currency which is converted in local currency unit by multiplying with exchange rate, PHI. F4Q(c) and F4P(c) are responsible for quantity and price shifts.

The collective export group, represented by the set NTRADEXP consists of services and other commodities for which the export quantity does not show much reaction to the price. These collective exports are treated as Leontief aggregate, the quantity of those is related to average price.

Other Demands

All other demands, like government demand, inventory demand and margin demand are treated differently. We assume that government demands are determined exogenously whereas inventory demands are determined such that percentage change in the volume of each commodity being added into inventories is taken same as the percentage change in domestic production of that commodity. Lastly, the demand for margins is assumed to be proportional to the flow of commodities to which margins are associated with.

Market clearing conditions are respected which ensure that for all commodities, the total supply is equal to total demand where total supply is composed of domestic production and imports and total supply is the aggregate level of supply for domestic use and exports.

Price System

Computable General Equilibrium model is based on competitive market assumption. Therefore, for each commodity there is a single price charged from the consumers and there is no pure profit in any commodity for any producer or distributor (P. B. Dixon et al., 1982). However, there are several sets of prices like purchaser's price which are paid by the consumers and thus include basic price, margins, indirect taxes and/or subsidies, basic value, price for capital unit, f.o.b.

foreign currency export price and c.i.f. foreign currency import prices. The price of imported good is also affected by exchange rate and tariffs and other such duties.

4.6 Trade Balance and Other Aggregates

Ordinary change in trade balance is modeled as a fraction of the ordinary change in GDP which is calculated by taking the ratio of change in nominal balance of trade to nominal GDP.

4.7 Factor Markets

The capital is created through investment and the investment in each industry is governed by one of the following three rules

a) More profitable an industry is, the more investment it will attract.
b) Industries in which government policy determines the level of investment, get investment as per national trend.
c) Investment follows the capital stock in an industry.

The last one is intended for long term simulations. We may assume fixed capital at aggregate level and let it be mobile within various sectors of economy and the capital supply from all categories is elastic.

For the labour market, following ORANI-G, current model has two options; either to employment exogenously and let market determine market clearing wages rate or setting wage rate exogenously and let market to determine the level of employment in the economy. In short run, we take wages as fixed exogenously. Moreover, the labour is assumed to be completely mobile between all industries and labour supply is elastic for all skill types.

Market clearing equations are used to equate the demand for and the supply of each factor. The income of the factors is determined by the payments made to them for their supply in the production activities. The income is defined by:

$$XLABSUP(o).ylab(o) = \sum_i X1LAB(o,i).[p1lab(o,i) + x1lab(o,i)] + XLABRO(o)[xlabro(o) + p1cap\_i(o)] \quad (4.14)$$

And

$$XCAPSUP(ge).ylab(ge) = \sum_i X1CAP(ge,i).[p1cap(ge,i) + x1cap(ge,i)] + XCAPRO[xcapro + p1cap_i] \quad (4.15)$$

4.8 Institutions

In our model, there are four institutions: households, firms or corporations, government and rest of the world. The details about them are given in followings

Household

Households own factors of production thus the income of household comes mainly from the supply of labour and capital. Other sources of income include transfer from government, rest of the world and other households. From the total income, households pay tax to the government,

spend on buying goods and services, and rest is saved. The taxes paid by the household are based on the marginal income tax rate structure. This can be represented as

$$yh(h) = \sum_{o} SLABSH(o,h).ylab(o,h) + \sum_{ge} SCAPSH(ge,h).ycap(ge,h) + TRHOGO(h) + TRHOCO(h) + TRHORO(h) + \sum_{g} TRHOHO(g,h) \quad (4.16)$$

And

$$eh(b) = MPCH(1 - TAXH).yh(h) = (1 - MPSH)(1 - TAXH).hy(h) \quad (4.17)$$

Where MPCH is household's marginal propensity to consumer and MPSH is household's marginal propensity to save.

Government

Taxes are a major part of government's income. There are various kinds of direct and indirect taxes that households and firms pay. Other sources of government revenue are transfer from foreign and revenue earned from the state-owned production factors. This can be summed up as:

$$VYGC = V1TAX\_CSI + V2TAX\_CSI + V3TAX\_CS + V4TAX\_C + V5TAX\_CS + V0TAR\_C + \sum_{h} TAXH.YH(h) + VCORTAX + VTRGORO + \sum_{o} SXLG(o)YLAB(o) + \sum_{gi} SXCG(gi).YCAP(gi) + VTRGOGO \quad (4.18)$$

Government expenditures constitute of expenditures on the purchase of goods and services, subsidies to households and firms and transfer to foreign and local parties. This is summarized as

$$VEGC = \sum_{c} V5PUR\_S(c) + \sum_{h} VTRHOGO(h) + VTRROGO + VTRGOGO + \sum_{c} VSR(c) + \sum_{c} V1OCT(i) \quad (4.19)$$

The difference between government income (VYGC) and expenditures (VEGC) is called as budget balance.

Firms

Firms earn income from their entity's ownership of production factors, which is capital in our model, net of the taxed paid and transfers received from other institutes whole their spending are the payments to factors and transfer to other institutions. That is,

$$VYCO = \sum_{gi} SCCO(gi).YCAP(gi) - VCORTAX + VTRCOGO + \sum_{h} VTRCOHO(h) + VTRCORO + VTRCOCO \quad (4.20)$$

And

$$VECO = \sum_{h} TRHOCO(h) + TRROCO + TRCOCO \quad (4.21)$$

The difference between income and expenditures are savings of the firms.

Rest of the World

Foreign income is the revenue of the rest of the world earned against owned factors of production, import of commodities and transfer from other institutions while foreign expenditure is the spending on exports, payments to factors of production and transfer to other institutions. This is represented as:

$$VYRO = \sum_{o} SLRO(o).YLAB(o) + SCRO.YCAP + \sum_{c} XCIF(c) + VTRROGO + \sum_{h} VTRROHO(h) + VTRROCO + VTRRORO \quad (4.22)$$

And

$$VERO = \sum_{c} V4PUR(c) + \sum_{o} XLABRO(o) + XCAPRO + \sum_{h} VTRHORO(h) + VTRGORO + VTRCORO + VTRRORO \quad (4.23)$$

Here the difference between income and expenditures is foreign savings.

4.9 Model Closure

For any model to reach to a stable solution, number of equations and endogenous variables must be the same. This is only possible by assuming some of the variables as exogenous, that is, determined outside the model. In present mode, the short run closure is defined by the assumption of fixed capital and therefore, no new investment. The rate of return on capital adjusts to equate the demand for and the supply of capital. Similarly, short run closure also assumes that real wage rate is predetermined. These are all assumed to be fully flexible in long run. However, the tax rates, technological changes and transfer between institutions are assumed to be exogenous in both short and long run. The exchange rate is assumed to be numeraire.

Policy Scenarios and Impacts

Following valuable comments received review, workshop, and consultative meeting, we decided to expand the scope of study and include corporate income tax and indirect tax scenarios as well. So, following will be the alternative scenarios to be tested against baseline scenario:

Simulation 1: Income Tax rate brackets

Table 7: Proposed Personal Income Tax Rate

Income	Tax Rate
≤ 400,000	0
400,001 – 800,000	Rs. 1000
800,001 – 1,200,000	Rs. 2000.
1,200,001 – 2,400,000	5%
2,400,001 – 4,800,000	Rs. 60,000 + 10%.
4,800,001 – 10,000,000,000	Rs. 300,000 + 15%.

Simulation 2: Flat income tax at rate 10% for households having taxable income of Rs. 400,000; corporate tax rate of 20%, Sales tax rate of 5%, custom duty at the rate of 5% across all commodities and no other tax as proposed by Bukhari & Haq (2016).

RESULTS AND INTERPRETATION

Modeling the policy changes required changing the marginal income tax rate by inputting new marginal income tax rates instead of existing. However, the equations of the model are not based on marginal income tax rate but on average tax rates. Therefore, average tax rates were calculated based on new marginal tax rates and thus these values were used as new tax rates. In this section, we present simulation results first on key macroeconomic indicators, followed by sectoral impacts and impacts on labour income. The two simulation scenarios are decreasing personal income tax rate along with a smaller number of slabs (SIM 1) and introducing fixed personal income tax along with reduction in corporate tax, sales tax and customs duty and abolishing all other taxes (SIM 2).

5.1 Key Macroeconomic Indicators

Simulation results on key macroeconomic indicators such as real gross domestic product (GDP), private consumption expenditures, investment expenditures, government consumption expenditures, exports, imports, and consumer price index (CPI) are presented in the table below. The results show that reducing personal income tax rates will leave households with higher disposable income. As a result of which, in the long run, the consumption expenditures of the households will increase by 0.4% and investment by 0.006%. This increase in household disposable income leads to more demand which is reflected by increase in imports by 0.069% and reducing exports by 0.389%. Government expenditures also rise by 0.032% and consumer price index rises by 0.119%. Increase in government expenditures will result in increasing the budget deficit and hence future interest and capital payments by the government. Together, all these components of demand result in reducing the real GDP by 0.102%.

Table 8: Key Macroeconomic Indicators

Indicators	**Long Run Impact**		**Short Run Impact**	
	SIM 1	**SIM 2**	**SIM 1**	**SIM 2**
GDP	- 0.102	0.158	0.024	0.031
Private Consumption	0.4	0.417	0.422	0.455
Investment	0.006	0.019	0.001	0.002
Govt Consumption	0.032	0.029	0.041	0.059
Exports	- 0.389	0.162	- 0.189	0.015
Imports	0.069	0.098	0.130	0.131
CPI	0.119	- 0.079	0.298	0.137

Note: Simulation Results

The reduction in personal income tax rate, adds more income into economy. However, most of this income goes into financing increased consumption expenditures. As savings grow slowly, which is reflected by smaller growth in investment, the domestic production fails to match with higher domestic demand. This is also fuelled by higher government expenditures and therefore, in case when balancing budget is not binding, this leads governments accumulating more debt and leaving less for private sector. As we constructed out model in a way that goods produced can be sold in domestic as well as in foreign market based on the prices producers receive, so exports get reduced and demand for goods produced in foreign countries increases. This together results

in decreasing the GDP. This suggests that along with decreasing income tax, government should also persuade to cut down its expenditures so that government has to borrow less, and more funds are available to private sector for increasing the production. moreover, this will also moderate increased aggregate demand and therefore, the demand for imports will reduce and supply of exports will improve which will result in lowering trade gap resulted from the reduced personal income tax.

Results of Simulation 2 can also be interpreted on the same lines. In this case, real GDP increases because of positive growth in private consumption, investment, government consumption, and higher trade. Significant difference can be noted in exports which experience an increase of 0.162% compared to a decline of 0.389% in case of lower PIT only. This is primarily because of low financial and compliance cost and simplified tax system which encourages more investment, and spares energies of business managers to be devoted to work.

Short run results are also reported which can be interpreted on the same lines. In short run, GDP growth is positive even in scenario 1 when there is a decrease in income tax only. The other difference is that there is price increase even in case when all the taxes are lower. This shows that decrease in the cost of production due to lower taxes is not passed through to the consumers in short run which is an indication of some kind of market power that is with the firms and some frictions in the economic system which result in delaying passing the benefit of decrease in cost to the consumers.

5.2 Sectoral Impacts

Long run sectoral impacts in terms of percent changes in output and prices are reported below. These impacts suggest that decreasing income tax rates and slabs only, as presented in simulation 1 (Sim 1) will result in decreasing the output of mining and related activities, textile, machinery, manufacturing and construction sectors etc. whereas it will result in increasing the output of electricity, trade at various level, hoteling, rent, financial services, education and health etc. On price side, the price of almost all the items will result in increasing because of higher demand driven by increase in take home income of the households. However, prominent increase can be seen in price of mining, textile, leather, agricultural goods, machinery, transportation services and real estate services.

Analyzing the impacts of cut in both direct and indirect taxes across the board, we can observe that here output will increase, and price will decrease for the output of most of the sectors. This shows that with a decrease in income tax, households will increase their consumption but most of the additional supply will come from the increase in imports, rather than from the increase in the output of the local production. This may be because here only households are given tax relief which results in increasing the demand and because of increase in income, households shift to buying imported goods which they think are of better quality. Therefore, significant growth in the output of the firms is not observed. Whereas, if we look at second scenario where flat personal income tax rate is combined with decrease in corporate income tax, sales tax, custom duty and abolishing all other taxes, this results in decreasing both financial as well as compliance cost of the firms. Therefore, now the firms are able to reap higher profits and hence look forward to expanding their production capacity. This is observed in increasing the output level as well as decrease in the price of a number of commodities which may be the result of decreasing the indirect taxes which are passed on to consumers.

Short run sectoral impacts are also reported for both simulation conditions in last two columns of the table. The numbers reported can be interpreted on the same lines. Overall, short run impacts are quite similar to long run outcomes however there are slight differences between the two cases such as in wood, paper making, chemicals, and construction sector in output and in textile, coke and public administration in prices.

Table 9: Sectoral Impacts of Tax Reforms

Commodities / Industries	**Long Run Impact**				**Short Run Impact**			
	SIM 1		**SIM 2**		**SIM 1**		**SIM 2**	
	Output	**Price**	**Output**	**Price**	**Output**	**Price**	**Output**	**Price**
Agriculture	0.096	0.205	0.107	0.012	0.101	0.199	0.103	0.013
Mining	- 1.023	0.283	0.210	0.016	- 0.233	0.263	0.119	0.019
Food	0.062	0.124	0.114	- 0.103	0.132	0.167	0.122	- 0.094
Textile	- 0.413	0.249	0.179	- 0.002	- 0.019	0.255	0.154	0.001
Leather	- 0.104	0.201	0.246	- 0.011	0.043	0.198	0.260	- 0.019
Wood	- 0.219	0.103	- 0.097	0.037	- 0.037	0.110	0.008	0.042
Paper	0.023	0.021	- 0.107	0.011	0.040	0.073	0.067	0.013
Coke	- 0.017	0.107	0.109	- 0.005	0.001	0.113	- 0.013	0.001
Chemicals	0.132	0.128	0.140	- 0.010	0.122	0.129	0.144	- 0.007
Rubber	0.097	0.094	0.107	0.004	0.101	0.100	0.121	0.010
Nonmetallic Minerals	- 0.521	0.066	- 0.877	- 0.016	- 0.239	0.072	- 0.767	- 0.008
Metals	0.012	0.100	0.093	0.009	0.107	0.106	0.104	0.012
Machinery	- 0.059	0.223	0.108	- 0.031	0.011	0.230	0.112	- 0.024
Electric Eq	0.394	0.195	0.455	0.009	0.104	0.202	0.461	0.011
Transport Eq	- 0.021	0.197	- 0.122	0.003	- 0.009	0.214	- 0.013	0.004
Manufacturing	- 0.031	0.182	0.140	- 0.011	0.016	0.186	0.140	- 0.017
Utility Supply	0.173	0.132	- 0.061	0.004	0.214	0.129	- 0.003	0.005
Construction	- 0.109	0.114	- 0.002	0.001	- 0.021	0.130	0.010	0.004
S&M of Vehicals	0.104	0.092	0.113	0.003	0.022	0.099	0.142	0.090
Wholesale Trade	0.098	0.057	0.102	- 0.017	0.100	0.070	0.079	- 0.009
Retail Trade	0.084	0.103	0.084	0.008	0.069	0.111	0.103	0.010
Hotels	0.102	0.034	0.214	0.011	0.092	0.053	0.200	0.012
Inland Trans	- 0.034	0.192	0.098	0.009	- 0.043	0.199	0.106	0.008
Water Trans	0.117	0.279	0.216	0.010	0.124	0.286	0.223	0.009

Air Trans	0.097	0.226	0.100	-0.017	0.103	0.233	0.099	- 0.012
Trans Services	0.037	0.198	0.049	0.007	0.078	0.201	0.063	0.014
Telecom	0.010	0.154	0.021	-0.006	0.031	0.193	0.101	- 0.001
Financial Inst	0.242	0.245	0.249	-0.011	0.098	0.267	0.216	- 0.003
Real Estate	0.131	0.271	0.102	0.018	0.129	0.290	0.113	0.012
Renting Business	0.034	0.109	0.021	-0.007	0.029	0.111	0.016	- 0.003
Pub Admn	- 0.140	0.112	0.138	-0.010	- 0.024	0.109	0.171	0.002
Education	0.152	0.158	0.168	0.001	0.155	0.169	0.201	0.009
Health	0.126	0.151	0.159	-0.005	0.121	0.162	0.189	- 0.001
Comm Services	- 0.042	0.023	0.003	0.008	- 0.019	0.030	0.021	0.012

Note: Simulation Results

As different sectors of an economy have strong forward and backward linkages, therefore, the effects of change in the cost of production and thus the price, transmit from one firm to the other and the transmission mechanism is stronger for input producing industries. According to Carvalho et al. (2021), the effects of change in the price of a good, produced by an industry impacts all industries that use this good as input especially when the elasticities of substitution between various intermediate inputs or between intermediates and factors of production are not equal to one. Blöchl et al. (2011); Fadinger et al. (2016) and McNerney et al. (2013) document that distributions of sectoral impacts are highly heterogeneous. The magnitude of the impact on other industries also depends on the size of industry. Carvalho et al. (2021) and Bernard et al. (2019) report that large firms in terms of sales and employees also have large number of buyers and suppliers and therefore have deeper effects on the input suppliers and output buyers. According to Barrot & Sauvagnat (2016) and Boehm et al. (2019) these effects may have significant impact on overall economy.

Both alternatives that this study proposes to test focus on decreasing the tax burden on both individuals and firms. Increase in disposable income of the households following decrease in income taxes leads to an increase in consumption demand and saving. The increased savings then leads to higher investment and therefore higher production. As a result, firms hire more factors of production, which decreases the unemployment and increase labour income and the GDP. Similarly, decrease in corporate income tax and custom duties leads to lowering the cost of production and increasing the output produced. However, lowering taxes also decreases government revenue collection, at least in short run, which may affect provision of public goods or lead to debt accumulation.

5.3 Effects on Labour Income

Lastly, we report the effect of change in tax rates on the income of different kinds of the labour incorporated in the model. The long run and short run results reported in the table below show that all the various categories of labour experience an increase in the income under both scenarios of tax rate decrease. However, the increase in labour income is higher in case of scenario

2 in which there is a decrease in the rate of all kinds of taxes which benefit not only households and result in increasing their demand for the product but also reduce the cost of production for the firms and therefore, making it more profitable for corporations to increase their production.

Table 10: Impact on Labour Income

Labour Classification	Long Run Income Effect		Short Run Income Effect	
	SIM 1	SIM 2	SIM 1	SIM 2
Punjab Rural Low Skilled	0.245	0.297	0.099	0.313
Punjab Rural High Skilled	0.341	0.439	0.162	0.492
Punjab Urban Low Skilled	0.279	0.301	0.103	0.381
Punjab Urban High Skilled	0.358	0.513	0.217	0.599
Sindh Rural Low Skilled	0.242	0.289	0.064	0.294
Sindh Rural High Skilled	0.281	0.357	0.103	0.401
Sindh Urban Low Skilled	0.299	0.348	0.199	0.481
Sindh Urban High Skilled	0.446	0.792	0.342	0.829
KP-Rural Low Skilled	0.241	0.331	0.197	0.367
KP-Rural High Skilled	0.34	0.392	0.223	0.396
KP-Urban Low Skilled	0.282	0.310	0.203	0.344
KP-Urban High Skilled	0.353	0.412	0.299	0.396
Baluchistan Rural Low Skilled	0.221	0.299	0.193	0.334
Baluchistan Rural High Skilled	0.253	0.398	0.210	0.402
Baluchistan Urban Low Skilled	0.25	0.351	0.144	0.377
Baluchistan Urban High Skilled	0.316	0.443	0.231	0.476

Note: Simulation Results

CONCLUSION AND POLICY RECOMMENDATIONS

This study is conducted to quantify the impact of changes in tax rate on the overall economy of Pakistan. For changing the tax rates, we are testing two circumstances, one is to decrease the marginal tax rate and the number of slabs for the individuals paying personal income tax but still keeping it progressive while the other one is to introduce a flat personal income tax rate along with decreasing corporate income tax, sales tax and custom duty along with abolishing all other direct and indirect taxes. Basically, both of these scenarios simplify the tax structure and reduce the tax burden, hence, leave the agents with higher after-tax income. We use computable general equilibrium model to study sectoral and macroeconomic impact of the said changes. However, for that we first developed an updated social accounting matrix based on 2017 data taken from Input-Output table 2017, national accounts data, household integrated economic survey and labour force survey for the said year. The SAM we developed for this study, consists of 34 industries, all producing one commodity, multiple types of labour, capital, and households and incorporate direct and indirect taxes paid by the households and firms to government. It gives us a good picture of the economy using double entry system in which each entry in a cell represents the flow of income from one agent to another. Afterward, we utilized ORANI-G of computable general equilibrium model with some modifications making it better applied to Pakistan economy and the objective of the study.

Our analysis shows that decreasing personal income tax rate applied to individuals only results in increasing disposable income of the households which results in increasing household consumption expenditures and decreasing government income and, hence expanding fiscal deficit. The increased demand is mostly filled from the goods and services produced in foreign and hence the trade deficit also widens. Whereas a tax cut across all the taxes, as modelled in scenario 2 enables firms to reap higher profit and thus the increased demand due to higher after-tax income is matched with higher supply resulted from higher production motivated by lower financial and psychic cost of production and higher profits. However, the rate of growth in output and prices is different for different sectors. Scenario 2 specially suits export industry as it reduces its cost thus making the exports more compatible. This is noted by an increase in the exports reflected in our analysis. Both these scenarios result in increasing the tax home income of various categories of labours and hence the income of the households. Higher consumption due to higher income increases the welfare of the households and improves their living standards. The expenditures on health and education also increase.

This analysis leads to some simple but important policy recommendations. One of the policies that can be recommended based on the analysis is that simplifying the tax regime and lowering taxes will result in higher income to the citizens and corporations, sectoral shift in favor of competitive and efficient sectors and resultantly higher economic growth. This higher growth will result in increasing the tax revenue without overburdening the citizens and businesses. Therefore, if government wants to raise the living standard of the people, it should introduce a simplified tax system which is broad based, but the burden of tax is low. Secondly, reducing rates of only one or few kinds of taxes will not work as effectively as lowering tax rates of all the taxes, reducing total number of taxes to be paid by firms and individuals and letting various sectors compete on the basis of productivity and efficiency rather than using tax as a tool for creating favourable grounds for few sectors. The results of the study also show that reducing tax rates will result in increasing fiscal deficit, however, if government is restricted to keep budget balance or

deficit under control, this will compel government to cut down or abolish unnecessary expenditures and reduce its footprint in the economy, which will result in lowering labour demand in public sector and releasing it for private firms which will result in reducing market distortions. Therefore, we recommend that government should be restricted to keep fiscal deficit within the target. Although this study did not extend to that area but literature suggests that combining simplified tax regime based on low tax rates benefits more to higher income groups than lower and hence on one hand it encourages wealth creation but on the other it increases inequalities which need to be taken care off well using suitable policies.

REFERENCES

Abdisa, T. (2018). Macroeconomic Impact of Tax Reform in Ethiopia. Journal of Economics and Sustainable Development, 9.

Ahmed, S., Ahmed, V., & O'Donoghue, C. (2011). Reforming indirect taxation in Pakistan: A macro-micro analysis. EJTR, 9, 153.

Amir, H., Asafu-Adjaye, J., & Ducpham, T. (2013). The impact of the Indonesian income tax reform: A CGE analysis. Economic Modelling, 31, 492–501.

Armington, P. S. (1969). A theory of demand for products distinguished by place of production. Staff Papers, 16(1), 159–178.

Auerbach, A. J. (1996). Measuring the impact of tax reform. National Tax Journal, 665–673.

Barrot, J.-N., & Sauvagnat, J. (2016). Input specificity and the propagation of idiosyncratic shocks in production networks. The Quarterly Journal of Economics, 131(3), 1543–1592.

Begg, D., Fischer, S., & Dornbusch, R. (2003). Economics (7th ed.). McGraw-Hill Education.

Belayneh, A. (2018). Economy wide Impact of Direct Tax Reform in Ethiopia: A Recursive Dynamic Computable General Equilibrium Analysis [PhD Thesis]. AAU.

Berisha, E. (2020). Tax cuts and" middle-class" workers. Economic Analysis and Policy, 65, 276–281.

Bernard, A. B., Moxnes, A., & Saito, Y. U. (2019). Production networks, geography, and firm performance. Journal of Political Economy, 127(2), 639–688.

Bhattarai, K., & Trzeciakiewicz, D. (2017). Macroeconomic impacts of fiscal policy shocks in the UK: A DSGE analysis. Economic Modelling, 61, 321–338.

Blöchl, F., Theis, F. J., Vega-Redondo, F., & Fisher, E. O. (2011). Vertex centralities in input-output networks reveal the structure of modern economies. Physical Review E, 83(4), 046127.

Boehm, C. E., Flaaen, A., & Pandalai-Nayar, N. (2019). Input linkages and the transmission of shocks: Firm-level evidence from the 2011 Tōhoku earthquake. Review of Economics and Statistics, 101(1), 60–75.

Breisinger, C., Thomas, M., & Thurlow, J. (2009). Social accounting matrices and multiplier analysis: An introduction with exercises (Vol. 5). Intl Food Policy Res Inst.

Carvalho, V. M., Nirei, M., Saito, Y. U., & Tahbaz-Salehi, A. (2021). Supply chain disruptions: Evidence from the great east japan earthquake. The Quarterly Journal of Economics, 136(2), 1255–1321.

Cororaton, C. B., & Orden, D. (2009). Poverty implications of agricultural and non-agricultural price distortions in Pakistan.

Damuri, Y. R., & Perdana, A. A. (2003). The impact of fiscal policy on income distribution and poverty: A computable general equilibrium approach for Indonesia. Economics Working Paper No. WPE068, Center for Strategic and International Studies, Jakarta, Indonesia.

Debowicz, D., Dorosh, P., Haider, H., & Robinson, S. (2012). A 2007-08 social accounting matrix for Pakistan. Pakistan Strategy Support Program (PSSP) Working Paper, 001.

Diao, X., Roe, T. L., & Yeldan, A. E. (1998). Fiscal debt management, accumulation and transitional dynamics in a CGE model for Turkey. Canadian Journal of Development Studies/Revue Canadienne d'études Du Développement, 19(2), 343–375.

Dixon, P. (2006). Evidence-based Trade Policy Decision Making in Australia and the Development of Computable General Equilibrium Modelling. Centre of Policy Studies (CoPS).

Dixon, P. B., Parmenter, B. R., Powell, A. A., Wilcoxen, P. J., & Pearson, K. R. (1992). Notes and problems in applied general equilibrium economics.

Dixon, P. B., Parmenter, B. R., Sutton, J., & Vincent, D. P. (1982). Orani, a multisectoral model of the Australian economy (Vol. 142). North Holland.

Dixon, P., & Rimmer, M. T. (2002). Dynamic general and equilibrium modelling for forecasting and policy: A practical guide and documentation of MONASH (Vol. 256). Elsevier.

Dorosh, P., Niazi, M. K., & Nazli, H. (2004). A Social Accounting Matrix for Pakistan, 2001-02: Methodology and Results. A Background Research Paper for the Pakistan Rural Factor Markets Study, World Bank. South Asia Rural Development Unit of the World Bank, Washington DC.

Eicher, T. S., Turnovsky, S. J., & Prunera, M. C. R. (2003). The impact of tax policy on inequality and growth: An empirical and theoretical investigation. Inequality and Growth: Theory and Policy Implications, MIT Press, Cambridge, MA.

Engen, E. M., & Skinner, J. (1996). Taxation and economic growth. National Bureau of Economic Research.

Fadinger, H., Ghiglino, C., & Teteryatnikova, M. (2016). Income differences and input-output structure.

Feldstein, M. (1973). On the optimal progressivity of the income tax. Journal of Public Economics, 2(4), 357–376.

Fortin, B., Marceau, N., & Savard, L. (1997). Taxation, wage controls and the informal sector. Journal of Public Economics, 66(2), 293–312.

Fossat, P., & Bua, M. (2013). Tax administration reform in the Francophone countries of Sub-Saharan Africa.

Gale, W. G., & Samwick, A. A. (2014). Effects of income tax changes on economic growth. Economic Studies, Https://Www. Brookings.

Edu/Wpcontent/Uploads/2016/06/09_Effects_Income_Tax_Changes_Economic_Growth_Gale_Sa Mwick. Pdf.

Gemmell, N. (1988). Tax systems, tax revenue and growth in LDCs: A review of empirical evidence. Intereconomics, 23(2), 84–90.

Giraldo, M. C., & García, J. A. B. (2018). Fiscal Policy and Inequality in a CGE Model for Colombia.

Golan, A., Judge, G., & Miller, D. (1997). Maximum entropy econometrics: Robust estimation with limited data.

Golan, A., Judge, G., & Robinson, S. (1994). Recovering information from incomplete or partial multisectoral economic data. The Review of Economics and Statistics, 541–549.

Gordon, R. (2010). Taxation in developing countries: Six case studies and policy implications. Columbia University Press.

Goulder, L. H., & Summers, L. H. (1989). Tax policy, asset prices, and growth: A general equilibrium analysis. Journal of Public Economics, 38(3), 265–296.

Hamilton, B., & Whalley, J. (1989). Reforming indirect taxes in Canada: Some general equilibrium estimates. Canadian Journal of Economics, 561–575.

Hasudungan, H. W., & Sabaruddin, S. S. (2016). The Impact of Fiscal Reform on Indonesian Macroeconomy: A CGE Framework. Central European Journal of Economic Modelling and Econometrics, 8(3), 181–202.

Horridge, J. (2000). ORANI-G: A general equilibrium model of the Australian economy. Centre of Policy Studies (CoPS).

Horridge, M. (2003). ORANI-G: A generic single-country computable general equilibrium model. Centre of Policy Studies and Impact Project, Monash University, Australia.

Huang, J., & Rios, J. (2016). Optimal tax mix with income tax non-compliance. Journal of Public Economics, 144, 52–63.

Huzaima Bukhari & Dr Ikramul Haq (2020). Towards Broad, Flat, Low-rate and Predictable Taxes (Revised and Expended Edition). Islamabad: PRIME Institute

Hussain, S. M., & Malik, S. (2016). Asymmetric effects of exogenous tax changes. Journal of Economic Dynamics and Control, 69, 268–300.

Iqbal, Z., Ayyubi, M. S., Farooq, A., & Lodhi, S. (2019). Microeconomic Impact of GST on Household Consumption Patterns in Pakistan. Forman Journal of Economic Studies, 15.

Judge, G. G., & Mittelhammer, R. C. (2011). An information theoretic approach to econometrics. Cambridge University Press.

Keen, M. (2012). Taxation and development-Again, IMF Working Paper, WP/12/220. International Monetary Fund Washington^ eDC DC.

Khan, M. A., Zada, N., & Mukhopadhyay, K. (2018). Economic implications of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) on Pakistan: A CGE approach. Journal of Economic Structures, 7(1), 1–20.

Knudsen, M. B., Pedersen, L. H., Pedersen, T. W., Stephensen, P., & Trier, P. (1998). A CGE Anlysis of the Danish 1993 Tax Reform. Danish Rational Economic Agents Model, DREAM.

Lee, Y., & Gordon, R. H. (2005). Tax structure and economic growth. Journal of Public Economics, 89(5–6), 1027–1043.

Lin, B., & Jia, Z. (2019). How does tax system on energy industries affect energy demand, CO2 emissions, and economy in China? Energy Economics, 104496.

Mabugu, R., Robichaud, V., Maisonnave, H., & Chitiga, M. (2013). Impact of fiscal policy in an intertemporal CGE model for South Africa. Economic Modelling, 31, 775–782.

Martimort, D. (2001). Optimal taxation and strategic budget deficit under political regime switching. The Review of Economic Studies, 68(3), 573–592.

McNerney, J., Fath, B. D., & Silverberg, G. (2013). Network structure of inter-industry flows. Physica A: Statistical Mechanics and Its Applications, 392(24), 6427–6441.

Mendoza, E. G., Razin, A., & Tesar, L. L. (1994). Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption. Journal of Monetary Economics, 34(3), 297–323.

Mertens, K., & Montiel Olea, J. L. (2018). Marginal tax rates and income: New time series evidence. The Quarterly Journal of Economics, 133(4), 1803–1884.

Mirrlees, J. A. (1971). An exploration in the theory of optimum income taxation. The Review of Economic Studies, 38(2), 175–208.

Mountford, A., & Uhlig, H. (2009). What are the effects of fiscal policy shocks? Journal of Applied Econometrics, 24(6), 960–992.

Nandi, A. (2020). Indian Fiscal Policy: A DSGE Primer. The Journal of Developing Areas, 54(2).

Naqvi, H. A., Hakeem, M. M., & Naeem, R. A. (2011). Impact of Agricultural Income Tax on Household Welfare and Inequality: Pakistan A Case-in-Point. International Journal of Business and Social Science, 2(6), 103–118.

Robinson, S., Cattaneo, A., & El-Said, M. (2001). Updating and estimating a social accounting matrix using cross entropy methods. Economic Systems Research, 13(1), 47–64.

Robinson, S., & Gueneau, A. (2013). CGE-W: An integrated modeling framework for analyzing water-economy links applied to Pakistan.

Romer, C. D., & Romer, D. H. (2010). The macroeconomic effects of tax changes: Estimates based on a new measure of fiscal shocks. American Economic Review, 100(3), 763–801.

Sahn, D. E., & Younger, S. D. (2000). Expenditure incidence in Africa: Microeconomic evidence. Fiscal Studies, 21(3), 329–347.

Samuelson, P. A. (1951). Theory of optimal taxation.

Shaikh, F. M. (2009). Analysis of bilateral trade liberalization and South Asian Free Trade Agreement (SAFTA) on Pakistan's economy by using CGE model. Journal of International Trade Law and Policy.

Shaikh, F. M., & Rahpoto, M. S. (2009). Impact of trade liberalization and SAFTA on Pakistan's Economy by Using CGE Model. International Journal of Business and Management, 4(4), 192.

Siddiqui, R., & Iqbal, Z. (1999). Social Accounting Matrix of Pakistan for 1989-90. Pakistan Institute of Development Economics.

Siddiqui, R., & Iqbal, Z. (2001). Tariff reduction and functional income distribution in Pakistan: A CGE model. Pakistan Institute of Development Economics.

Siddiqui, R., Kemal, A. R., Siddiqui, R., & Ali Kemal, M. (2008). Tariff reduction, fiscal adjustment and poverty in Pakistan: A CGE-based analysis.

Waheed, A., & Ezaki, M. (2008). Aggregated and compact disaggregated financial social accounting matrices for Pakistan. Journal of Economic Cooperation, 29(4), 17–36.

Wawire, N. (2017). Determinants of value added tax revenue in Kenya. Journal of Economics Library, 4(3), 322–344.

Yusuf, A. A., Djoni, H., & Wawan Hermawan, Y. (2007). AGEFIS: Applied general equilibrium for fiscal policy analysis. Working Paper in Economics and Development Studies.

Zeshan, Muhammad (2020). 'Chapter: Pakistan', in Aguiar,A., Chepeliev, M., Corong, E. L., McDougall, R. and van der Mensbrugghe, D., 2019. The GTAP data base: version 10. Journal of Global Economic Analysis, 4(1), pp. 1 – 27.